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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
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ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 08/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/823,841	POCIUS ET AL.	
	Examiner	Art Unit	
	Alessandro V. Amari	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 December 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-52* is/are pending in the application.

4a) Of the above claim(s) *6,14-22,25,26,35-40,48 and 49* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-5,7-13,23,24,27-34,41-47 and 50-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Previous Claim Rejections - 35 USC § 102/103

1. The final rejection mailed on 17 March 2003 is hereby withdrawn due to references that read on claims 4 and 31-33. Examiner regrets any inconvenience caused by this action and the following new non-final rejection is hereby substituted for the previous final rejection.

Claim Objections

2. Claim 8 is recited as being dependent on claim 1 which has been canceled.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2-3, 5, 7, 8-13, 23-24 and 27-30, 34, 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al U.S. Patent 4,689,652.

In regard to claim 3, 5, 12, 27, 41 and 42, Paoli teaches (see Figure 1B, 4, 7, 8) a method of forming a light emitting device, said method comprising: forming at least one of Fresnel lens (178) and holographic diffuser (86 in Figure 4) on at least one surface of a semiconductor light emitter to affect light emitted by said semiconductor light emitter (30) as described in column 2, lines 67-68 and column 3, lines 1-30 and column 12, lines 25-48. Regarding claim 2, Paoli discloses (see Figure 7) that said semiconductor

light emitter has at least one light extraction surface (182) from where light is intended to be extracted, and wherein said forming is done on at least one extraction surface of said semiconductor light emitter as described in column 12, lines 25-38. Regarding claim 7, Paoli discloses that said method further comprises confining light emission to a preselected section of said light emitting layer as described in column 5, lines 60-68. Regarding claim 8, Paoli discloses that said confining comprises at least one method selected from applying the Holonyak process, using selective area growth, using selective area bonding, using diffusion and using ion implantation as described in column 5, lines 17-24. Regarding claims 9 and 13, Paoli discloses coating one or more surfaces of said semiconductor light emitter with a reflective material as described in column 9, lines 23-26. Regarding claim 10 (which is dependent off of claim 1), Paoli discloses coating said holographic diffuser with a reflective material as described in column 10, lines 43-49. Regarding claim 11, Paoli discloses forming an optical element on the surface opposite of said extraction surface as described in column 12, lines 25-48. Regarding claim 23, Paoli discloses that said first optical element is designed to achieve one of light focusing, light collimating, and light diverging as described in column 12, lines 39-45. Regarding claim 24, Paoli discloses that said first optical element is designed to direct light in a preselected direction as described in column 12, lines 39-45. In regard to claim 27, Paoli teaches (see Figure 7) a method of forming a light emitting device, said method comprising: forming at least one optical element (178) on at least one surface of a semiconductor light emitter to affect the light emitted by said semiconductor light emitter as described in column 2, lines 67-68 and column 3, lines 1-

30 and column 12, lines 25-48. Regarding claim 28, Paoli teaches coating a surface of said light emitting device with a reflective layer as described in column 9, lines 23-26. Regarding claim 30, Paoli teaches that said semiconductor layer comprises a transparent aluminum-bearing compound as described in column 4, lines 21-35. In regard to claim 34, Paoli teaches (see Figures 1B, 7, 8) a light emitting device comprising a semiconductor light emitter (30); and at least one optical element on at least one surface of said semiconductor light emitter, wherein said optical element is a first optical element (178) as described in column 2, lines 67-68 and column 3, lines 1-30 and column 12, lines 25-48.

However, in regard to claims 3, 5, 12, 27 and 41, Paoli does not teach that said forming comprises pressing a stamping block against at least one surface of the semiconductor light emitter or that the forming comprises at least one method selected from ablation, machining, scribing, electron discharge machining and stamping.

In regard to claims 3, 5 and 12, Shimada et al. does teach forming at least one of Fresnel lens and holographic diffuser by stamping at least one optical element and that stamping is done on at least one of a semiconductor layer and a substrate layer of said semiconductor light emitter as described in column 8, lines 15-35. Regarding claims 27, 29 and 34, Shimada et al. does teach stamping at least one optical element and that stamping is done on at least one of a semiconductor layer and a substrate layer of said semiconductor light emitter as described in column 8, lines 15-35.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to stamp the optical element as taught by Shimada et al. in the device of Paoli in order to form a Fresnel lens on the device.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al U.S. Patent 4,689,652 and further in view of Kish et al U.S. Patent 5,376,580.

Regarding claim 4, Paoli in view of Shimada et al teaches the invention as set forth above but does not teach that said forming is executed concurrently with a wafer-bonding process, said wafer bonding process comprising removing a first substrate of said semiconductor light emitter and bonding a second substrate to said semiconductor light emitter.

Regarding claim 4, Kish et al does teach said forming is executed concurrently with a wafer-bonding process, said wafer bonding process comprising removing a first substrate of said semiconductor light emitter and bonding a second substrate to said semiconductor light emitter as described in column 3, lines 28-48, column 6, lines 36-68 and column 7, lines 23.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the wafer bonding process as taught by Kish et al in the light emitting device of Paoli in view of Shimada et al in order to increase mechanical and/or thermal stability of the light emitting device.

6. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al U.S. Patent 4,689,652 further in view of Fogarty U.S. Patent 5,141,677.

Regarding claims 31-33, Paoli in view of Shimada et al teaches the invention as set forth above but does not teach that said stamping is executed at an elevated temperature, said elevated temperature being higher than room temperature or lowering said elevated temperature to facilitate the separation of a stamping block from said semiconductor light emitter after said stamping or that said elevated temperature is higher than the ductile transition temperature of the material constituting said at least one surface on which the optical element is formed.

Regarding claims 31-33, Fogarty teaches that said stamping is executed at an elevated temperature, said elevated temperature being higher than room temperature as described in column 9, lines 19-25 or lowering said elevated temperature to facilitate the separation of a stamping block from the light emitter after said stamping as described in column 9, lines 41-45 or that said elevated temperature is higher than the ductile transition temperature of the material constituting said at least one surface on which the optical element is formed as described in column 8, lines 17-24.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the stamping temperatures and processes as taught by Fogarty in the light emitting device of Paoli and Shimada et al in order to produce optical elements efficiently and with high precision.

7. Claim 43 is rejected under 35 U.S.C. 103(a) as being anticipated by Tomomura et al. U.S. Patent 4,988,579 in view of Shimada et al U.S. Patent 4,689,652.

In regard to claim 43, Tomomura et al. discloses (see Figures 8, 11, 12) a display device comprising at least one blue light emitting device, at least one green light emitting device, and at least one red light emitting device as described in column 7, lines 36-68 and column 8, lines 1-3, wherein at least one of said blue light emitting device, green light emitting device, and red light emitting device comprises: a semiconductor light emitter (233); and one of a Fresnel lens (131) and a holographic diffuser formed on a surface of said semiconductor light emitter as described in column 12, lines 8-15.

However, Tomomura et al. does not teach that the Fresnel lens or holographic diffuser is stamped on a surface of said semiconductor light emitter.

Regarding claim 43, Shimada et al. does teach forming at least one of Fresnel lens and holographic diffuser by stamping on surface of semiconductor light emitter as described in column 8, lines 15-35.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to stamp the optical element as taught by Shimada et al. in the device of Paoli in order to form a Fresnel lens on the device.

8. Claims 43 and 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al. U.S. Patent 4,689,652 and in further view of Tomomura et al. U.S. Patent 4,988,579.

In regard to claims 43 and 44, Paoli teaches (see Figure 1A, 7, 8) a display device comprising a light emitting device which comprises: a semiconductor light emitter (30); and one of a optical element (178) formed on a surface of said semiconductor light emitter as described in column 2, lines 67-68 and column 3, lines 1-30 and column 12, lines 25-48.

However, Paoli does not teach an optical element stamped on a surface of said semiconductor light emitter.

Shimada et al. does teach stamping at least one optical element on surface of said semiconductor light emitter as described in column 8, lines 15-35.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to stamp the optical element as taught by Shimada et al. in the device of Paoli in order to form an optical element.

Furthermore, Paoli in view of Shimada et al. does not teach a display device comprising at least one blue light emitting device, at least one green light emitting device, and at least one red light emitting device.

Tomomura et al. does teach (see Figures 11 and 12) a display device comprising at least one blue light emitting device, at least one green light emitting device, and at least one red light emitting device, wherein at least one of said blue light emitting device, green light emitting device, and red light emitting device as described in column 7, lines 36-68 and column 8, lines 1-3.

It would have been obvious to one having ordinary skill in the art at the time the invention was made utilize the red, green and blue light emitting devices as taught by

Tomomura et al. in the combination in order to produce light with high efficiency and brightness over a large spectral range.

9. Claims 45, 46, 50 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al U.S. Patent 4,689,652.

In regard to claims 45 and 52, Paoli teaches a light emitting device or a method for forming a light emitting device or semiconductor light emitter, said method comprising, forming an optical element in a material, said material being transparent to light emitted from said light emitting device, said material being one of high index optical glass, III-V semiconductors, II-VI semiconductors, group IV semiconductors, high-index organic semiconductors, high index organic compounds, and mixtures and alloys thereof; and bonding said material to a semiconductor light emitter as described in column 12, lines 49-68.

Regarding claim 50, Paoli teaches bonding said material to a semiconductor light emitter with a bonding material, said bonding material (196) being one of high index optical glass, III-V semiconductors, II-VI semiconductors, group IV semiconductors, high index organic semiconductors, high index organic compounds, and mixtures or alloys thereof as described in column 12, lines 49-58.

However, Paoli does not teach stamping an optical element in the material.

In regard to claim 45, Shimada et al teaches stamping an optical element in a material as described in column 8, lines 15-35.

Regarding claim 46, Shimada et al wherein said stamping precedes said bonding as described in column 8, lines 15-35.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to stamp the optical element as taught by Shimada et al. in the device of Paoli in order to form a Fresnel lens on the device.

10. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al. U.S. Patent 4,689,652.

Regarding claim 47, the combination teaches the invention as set forth and wherein said stamping precedes said bonding but does not teach the reverse, i.e., said bonding precedes said stamping. It would have been obvious to one having ordinary skill in the art at the time the invention was made to reverse the process wherein bonding precedes stamping, since it has been held that a mere reversal of working parts of a device involves only routine skill in the art. One would have been motivated to reverse the process for the purpose of securing proper attachment of the material to the semiconductor light emitter.

11. Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Paoli U.S. Patent 5,317,170 in view of Shimada et al. U.S. Patent 4,689,652.

Regarding claim 51, the combination teaches the invention as set forth above, but does not teach that bonding comprises pressing said material together with said semiconductor light emitter at a temperature greater than room temperature.

Official notice is taken that it is notoriously old and well known in the semiconductor art to bond material together at a temperature greater than room

temperature. It would have been obvious to one of ordinary skill in the art at the time the invention was made to bond material together at a temperature greater than room temperature in order to achieve proper adhesion.

Response to Arguments

12. Applicant's arguments filed 31 December 2003 have been fully considered but they are not persuasive.

The Applicants argue that it would not have been obvious to substitute stamping for the ion milling or reactive ion etching techniques cited by Paoli to form Fresnel lenses. Furthermore, the applicant state that since the surfaces of semiconductor light emitters are generally crystalline and very hard, stamping is far more difficult than ion milling or reactive ion etching and less likely to be successful in forming an optical element, Fresnel lens or holographic diffuser.

In response to this argument, the examiner would like to point out that Paoli does teach that the Fresnel lens, "can be formed by ion milling or reactive ion etching **or other means as is known in the art.** (see Paoli, column 12, lines 31-34). Stamping is indeed another well known means of forming Fresnel lenses as shown in the secondary reference, Shimada et al in the office action. By arguing that stamping is far more difficult on a surface of a semiconductor light emitter, the applicants seems to be undercutting their claimed invention, by asserting that stamping an optical element on a semiconductor light emitter is "less likely to be successful in forming an optical element" since the applicants recites a semiconductor light emitter in all of the independent claims. Furthermore, surfaces of semiconductors vary widely in regard to their

hardness or brittleness. The Examiner would also like to point out that there is no known method of forming a holographic diffuser by stamping. Holographic elements are formed by interference of light beams in order to record an interference pattern in a medium.

The Applicant further argue that forming the Fresnel lens or holographic diffuser comprises at least one method selected from ablation, machining, scribing, electron discharge machining and stamping while Paoli teaches only ion milling or reactive ion etching techniques. In response to this argument, the examiner would like to point out that Paoli does teach that the Fresnel lens, "can be formed by ion milling or reactive ion etching **or other means as is known in the art.** (see Paoli, column 12, lines 31-34). Stamping is indeed another well known means of forming Fresnel lenses as shown in the secondary reference, Shimada et al in the office action. Also, the other methods recited are well known methods in the art to form Fresnel lenses.

The Applicant further argue that the prior art, Ito et al does not teach that the optical element is on at least one surface of a semiconductor light emitter but that Ito et al teaches that the semiconductor light emitter is separated from the lens by a mold resin, adhesive agent and a glass substrate.

In response to this argument, the Examiner would like to point out that that Ito teaches an embodiment as shown in Figure 6, which shows a semiconductor light emitter (2) and a lens element (41 which is part of the mold resin 9). Giving the broadest reasonable interpretation to the claim language, Ito (as shown in Figure 6) does indeed

show an optical element formed of a material (9) which is on or on top of at least one surface of a semiconductor light emitter and thus reads on the claims.

Applicants further argue that the prior art, Tomomura et al. does not teach at least one of a Fresnel lens and a holographic diffuser stamped on a surface of a semiconductor light emitter but instead teaches that the lens is formed within the semiconductor light emitter, not on the surface.

In response to this argument, the Examiner would like to point out that given the broadest reasonable interpretation of the claim language, the Fresnel lens (131) is on top of a surface of a semiconductor light emitter (4) as shown in Figure 8 and thus reads on the claim.

The Applicants further argue that Shimada et al teaches a stamping die of photoresist and that there is no motivation to use such a stamping die to form Paoli's Fresnel lens because such a stamping die is not strong enough to stamp the surface of a semiconductor light emitter because such surfaces are generally crystalline and extremely hard.

In response to this argument, the Examiner would like to point out that stamping is a very well known means of forming Fresnel lenses as shown in the secondary reference, Shimada et al in the office action. Furthermore, surfaces of semiconductors vary widely in regard to their hardness or brittleness so there is every reason to believe that the stamping die of Shimada will form the Fresnel lens. The Examiner would also like to point out that there is no known method of forming a holographic diffuser by

stamping. Holographic elements are formed by interference of light beams in order to record an interference pattern in a medium.

The Applicants further argue that Paoli does not teach stamping an optical material and bonding said material to a semiconductor light emitter since Paoli forms the lens as part of the device, not as a separate piece that is later bonded to a semiconductor light emitter.

In response to this argument, the Examiner draws applicants attention to column 12, lines 49-53 of Paoli which states:

> "As shown in FIG. 8, a laser array 188 is fabricated in the identical fashion to laser array 78 of FIG. 4 except that an *array 190 of micro lenses 192 are positioned flush* with the exposed surface 194 of the n-contact layer 196. (italics examiner's)

This text clearly indicates that the micro lenses must be produced as a separate piece in order to then position them flush with the n-contact layer of the semiconductor light emitter.

The Applicants further argue that Shimada's stamping block is not strong enough to successfully stamp a Fresnel lens in Paoli's contact layer.

In response to this argument, the Examiner would like to point out surfaces of semiconductors vary widely in regard to their hardness or brittleness so there is every reason to believe that the stamping die of Shimada will form the Fresnel lens. Furthermore, the Applicants recite that the material in which the optical element will be stamped is one of high index optical glass, III-V semiconductors, II-VI semiconductors,

group IV semiconductors, high-index organic semiconductors, high index organic compounds, and mixtures and alloys thereof. Given this broad range of materials, it is reasonable to expect that the stamping block as taught by Shimada will be able to stamp the claimed surfaces such as putting a alloy (i.e., a metal) which will soften the claimed material.

The Applicants further argue that separately forming a Fresnel lens then bonding the lens to a device as taught by Shimada et al would significantly complicate the fabrication of Paoli's technique of etching or milling the lens during fabrication of the device.

In response to applicants arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In the instant case, the combination teaches formation of a Fresnel lens by stamping (as taught by Shimada et al) a surface area of Paoli since stamping is a well known method in the art to form optical elements in light emitting surfaces. Furthermore, column 12, lines 49-53 of Paoli clearly indicates that the micro lenses can be produced as a separate piece in order to then position them flush with the n-contact layer of the semiconductor light emitter. The Applicants present no evidence for their assertion that separate formation of the lens and then bonding the lens to the device would significantly complicate the fabrication of the device.

The Applicants again argue that in regard to claim 44, it would not have been obvious to stamp Paoli's semiconductor layer with Shimada's stamping block because such a stamping block would not be strong enough to stamp semiconductor.

In response to this argument, the Examiner would like to point out surfaces of semiconductors vary widely in regard to their hardness or brittleness so there is every reason to believe that the stamping die of Shimada will form the Fresnel lens.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alessandro V. Amari whose telephone number is (703) 306-0533. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on (703) 305-0024. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

MARK A. ROBINSON
PRIMARY EXAMINER

ava AVA
July 31, 2003